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SPINDLE-MOISTENING AGENTS FOR MECHANICAL COTTON PICKERS: AN EVALUATION

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The picking spindles of most mechanical cotton pickers require moistening with water or some other material for best performance. The primary function of moistening is to keep the spindles clean of plant juices, which tend to build up deposits if not removed. These deposits make doffing the cotton from the spindle difficult and contribute to stains in the picked cotton.

Most manufacturers of pickers who recommend moistening with water also recommend adding a wetting agent to aid in cleaning the spindles. Light oils, commonly known as textile conditioning oils, have also been used in lieu of water. Fear on the part of cotton millers that these oils would adversely affect spinning performance prompted the research study reported here. The research was conducted at Shafter, Calif., and Stoneville, Miss., from 1955 to 1958.[2/]

TEST PROCEDURES

The tests were designed with the same major treatments at both locations: (1) three rates of textile oil and (2) three rates of water with a nonionic wetting agent. At Stoneville, additional treatments of three rates of plain water were included the first year (1955).[3/] In subsequent years the variables

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2/ This research was a cooperative effort of the following personnel and organizations: J. R. Tavernetti, Agricultural Engineer, University of Calif.; L. M. Carter, Agricultural Engineer, AERD, ARS, Shafter, Calif.; C. G. Leonard, Physicist, AERD, ARS, Mesilla Park, N. Mex.; E. B. Williamson, O. B. Wooten, and Floyd Fulgham, Agricultural Engineers, AERD, ARS, Stoneville, Miss.; R. A. Montgomery, Cotton Technologist, formerly with U.S. Cotton Ginning Research Laboratory, and the authors.

3/ Wooten, O. B., and Montgomery, R. A. Effects on Machine-picked Cotton of Relative Humidity and Spindle Moisture. Cotton Gin and Oil Mill Press 57(6): 7-8.

were reduced to two rates each of textile oil, plain water, and water with a wetting agent, as given in the tables. The low rate for each material was determined by field trials to be the minimum rate at which it would do a satisfactory job of picking and at the same time keep the spindles clean. This is the rate that a careful farmer would use, and it would vary among areas because of picking and climatic conditions. The high rates were thought to be extremes that would be encountered in actual farm practice.

FIELD TEST CONDITIONS
Shafter, Calif.

Cotton used for the tests was Acala 4-42 grown in Kern County, Calif.[4/] It was grown on beds and had been furrow-irrigated during the season. In 1955 the cotton was uniform in height (3 to 4.5 feet) and standing upright. The yield was about 2.3 bales per acre. It was about 70 percent defoliated and was free of weeds.

In 1956 the cotton was variable, ranging from 3 to 6 feet in height, with some rank lodged portions. Defoliation ranged from 50 percent to 90 percent; there were considerable green bolls and leaves. Yield was about 2 bales per acre.

Harvesting both years was in October, when the weather was clear, calm, and relatively dry. Temperatures ranged from a minimum of 55° F. in the morning to a maximum of 80° F. in the afternoon. The relative humidity ranged from 60 down to 30 percent.

A relatively new single-row, high-drum cotton picker with tapered, broached spindles was used for the tests. It was operated at 2 miles per hour by an experienced driver. Four randomized replications were harvested for each treatment. In 1955 each replication yielded approximately 1/2 bale while in 1956 each replication yielded about 1/4 bale. All cotton was ginned the same day it was picked, except that picked late in the day, which was held under cover until the following morning.

The ginning was done in a modern gin which was equipped with a 24-shelf tower drier. The drier operated with inlet air temperature between 190° and 205° F., moderate overhead seed cotton cleaning, and single saw-type lint cleaning.

4/ Tavernetti, J. R., Leonard, C. G., and Carter, L. M., Spindle Moistening Agents. Cotton Gin and Oil Mill Press. 58(24):20-21,24.

Stoneville, Miss.

Cotton tested at Stoneville was Delfos 7343 in 1955 and 1956, and Delfos 8274 in 1958. These were similar strains of the Delfos variety produced by the Delta Branch Experiment Station. The tests were not conducted in 1957 because of adverse weather conditions. The cotton was hill-dropped approximately 16 inches on center and the plant population ranged from 40 to 50 thousand plants per acre. Conventional mechanized cultural practices were used. At harvesttime the plants were upright, from 4 to 5 feet tall, and the yield was about 1-1/2 bales per acre each year.

A defoliant applied 2 weeks before harvest removed approximately 90 percent of the leaves each year. Some regrowth of new leaves had begun to appear at harvesttime in 1955.

The picker used was a one-row, high-drum machine with tapered, broached spindles. It was specially equipped with purgerator meters and an electric pump for accurately metering water, and a pump and orifice plate metering device for metering oil. A high-pressure sprayer was used to clean the picker between main treatments. Three randomized replications were harvested for each treatment. The cotton was dumped in wire-mesh-sided trailers and ginned as soon as possible on the same day.

A conventional ginning machinery setup suitable for handling machine-picked cotton was used. In 1955 the setup was as follows: Tower drier, 6 cylinder cleaner, bur machine, extractor feeder cleaner, and unit lint cleaner. In 1956 and 1958 an additional tower drier and an additional 13 cylinders of cleaning were used.

SAMPLING PROCEDURES

Standard sampling procedures were used at both locations. Picker efficiency was based on clean seed cotton and was obtained by hand-gleaning in accordance with Souther Cooperative Series, Bulletin 71, "Weed Control Equipment and Methods for Mechanized Cotton Production." Moisture content of the seed cotton on the plant was obtained by hand-picking samples from each replication just before harvesting. Moisture content of the machine-picked seed cotton was obtained by taking samples from the trailer for each replication immediately after the cotton was dumped by the picker. Trash content of the seed cotton was obtained from samples taken from the trailer, while that of the lint was obtained from samples taken from the lint slide in the gin. Two 1-pound samples per replication were taken from the lint slide for grade classing and fiber analysis. Two 10-pound samples per treatment were taken from the lint slide for spinning and dyeing tests. In addition, samples were taken at the gin for seed cotton moisture and foreign-matter determinations.

RESULTS
Shafter, Calif.

Results of the California Tests are given in tables 1 and 2. Picking efficiency was reduced with the textile oil, particularly at the low rates. The oil, however, did an excellent job of keeping the spindles clean.

There was no significant difference in picking efficiency between plain water and water plus a wetting agent, nor between the various rates at which these materials were used. Both did a reasonably good job of keeping the spindles clean, particularly at the high rates of application.

There was no correlation between the amount of water used and the increase in moisture of the seed cotton during picking. The maximum increase was about 3 percent. There was an increase of from 1 to 2-1/2 percent with the oil, for which no explanation is known.

Neither the kind nor the quantity of moistening material had any effect on the trash content of either the seed cotton or the lint. There were no noticeable differences in the ginning of any of the lots of cotton except that with the cotton containing textile oil, light blue smoke was emitted from the drier exhaust.

There were variations in the grades, but these could not be correlated with either the kind or the quantity of moistening agent. This was true both for the grades based on lint trash only and for the composite grades. The analyses of classer's grades and of picker performance indicate that textile oil, plain water, or water plus a wetting agent can be used without seriously affecting the grade of the cotton, but that oil reduces the efficiency of the mechanical picker, especially at low rates of application.

Lint samples for all treatments, except the one in which water was applied to the picker spindles at the rate of 4 gallons per bale in 1955, were processed into carded 22's and 50's yarns. Luster measurements were made on the gray 22's and 50's yarns and on the 50's yarn after it was mercerized. Color measurements were made on the 22's yarn when it was gray and after it was bleached and dyed blue.

Partial results of these measurements are given in tables 1 and 2. There were no statistically significant differences in any of the spinning and finishing measurements for 1955. In 1956, there were significant differences in effects of treatment at the 95-percent confidence level in seven measurements. The practical importance of these differences is doubtful, however, since they are near to or less than the standard error of the measurements involved. Yet when the treatments are ranked from highest to lowest quality for each of the seven measurements, the overall best treatments are water plus wetting agent applied at the low rate, and plain water applied at the high rate. The poorest treatments are textile oil applied at the high rate followed by textile oil applied at the low rate.

Table 1. Cotton picker efficiency, moisture, and foreign matter content, grade classification, spinning performance, and yarn color results associated with the use of different moisture agents, at three rates of application in harvesting cotton, Shafter, Calif., crop of 1955.

Test item	Moistening material and rate of application					
	Water and wetting agent per bale[1]			Textile oil per bale		
	2 gals.	4 gals.	8 gals.	1 pint	3 pints	7 pints
Picker efficiency, percent	92.6	92.4	92.9	88.5	89.9	91.5
Moisture content of seed cotton:						
Plant sample, percent	6.2	6.2	5.7	5.7	6.8	6.5
Trailer sample, percent	8.1	9.1	8.6	7.8	9.5	8.6
Foreign-matter content:						
Seed cotton, percent	9.9	11.2	9.0	10.0	10.3	9.4
Lint cotton, percent	4.3	3.4	3.9	3.6	4.0	4.3
Grade classification, index[2]	100.8	101.0	100.2	100.2	100.0	100.2
Spinning data:						
Manufacturing waste, percent	8.77	[3]	8.52	8.61	8.03	8.33
Neps, per 100 sq. in. card web	15.5	--	12.5	17.5	13.0	19.0
Avg. yarn appearance 22's & 50's index[4]	98	--	95	100	98	98
Yarn strength:						
22's, pounds	139.3	--	138.6	130.6	138.6	136.2
50's, pounds	49.5	--	50.4	50.0	50.3	48.8
50's (mercerized), pounds	51.4	--	51.3	51.6	52.6	50.8
Avg. break factor:[5]						
22's & 50's	2,770	--	2,784	2,788	2,782	2,718
50's (mercerized)	2,570	--	2,565	2,582	2,630	2,540
Color:[6]						
22's gray yarn, Rd	73.4	--	72.5	72.5	72.6	71.6
+b	10.6	--	10.7	10.5	10.9	10.7
22's yarn dyed blue, Rd	25.5	--	24.6	24.8	24.1	24.0
-b	22.1	--	21.6	21.6	21.6	21.8

1/ 1/2 pint of wetting agent to 30 gallons of water.
2/ 100 = Middling; 102 = Middling plus.
3/ Samples from this treatment not tested.
4/ Index of average quality equals 100.
5/ Break factor is based on yarn skein strength (yarn number × yarn strength).
6/ Color measured in terms of Rd and B scales of the Gardner Automatic Color-Difference Meter. Rd values indicate percentage of reflectance from 0 to 100; +b values indicate degree of yellowness; and -b values indicate degree of blueness.

Table 2. Cotton picker efficiency, moisture and foreign matter content, grade classification, spinning performance, and yarn color results associated with the use of different moistening agents, at two rates of application, in harvesting cotton, Shafter, Calif., crop of 1956.

Test item	Moistening material and rates of application					
	Plain water per bale		Water and wetting agent per bale[1/]		Textile oil per bale	
	2 gals.	8 gals.	2 gals.	8 gals.	2 pints	6 pints
Picker efficiency, percent	85.2	83.1	84.1	84.1	80.9	82.4
Moisture content of seed cotton:						
Plant sample, percent	7.8	8.3	7.8	9.7	7.4	7.1
Trailer sample, percent	8.9	10.3	9.7	11.5	8.6	8.8
Foreign-matter content:						
Seed cotton, percent	7.0	6.6	8.0	6.4	7.2	7.5
Lint cotton, percent	2.8	3.2	3.3	3.3	3.1	3.2
Grade classification, index[2/]	99.0	94.0	96.0	94.0	96.0	96.0
Spinning data:						
Manufacturing waste, percent	8.34	8.00	8.25	8.35	8.08	7.89
Neps, per 100 sq. in. of card web	8.5	9.0	8.5	10.0	15.5	12.0
Avg. yarn appearance, 22's and 50's, index[3/]	97.5	100.0	100.0	95.0	92.5	95.0
Yarn strength,						
22's, pounds	138.4	138.7	139.8	140.0	139.2	136.2
50's, pounds	49.0	49.6	49.8	49.6	49.3	48.4
50's (mercerized), pounds	50.1	50.7	51.0	51.2	50.2	50.4
Avg. break factor[4/]						
22's and 50's	2,748	2,766	2,784	2,774	2,763	2,710
50's (mercerized)	2,505	2,538	2,550	2,562	2,512	2,522
Color:[5/]						
22's gray yarn Rd.[6/]	71.3	71.1	71.4	69.7	70.2	69.4
+b[6/]	11.1	11.0	11.4	10.9	10.9	10.9
22's yarn dyed blue Rd.[6/]	24.8	24.9	24.9	24.1	24.7	24.2
-b	20.8	20.6	20.6	20.6	20.6	20.7

1/ 1/2 pint of wetting agent to 30 gallons of water.
2/ 94 = SLM; 97 = SLM plus; and 100 = Middling.
3/ Index of average quality equals 100.
4/ Break factor is based on yarn skein strength (yarn number X yarn strength).
5/ Color measured in terms of Rd and b scales of the Gardner Automatic Color-Difference Meter. Rd values indicate percentage of reflectance from 0 to 100; +b values indicate degree of yellowness; and -b values indicate degree of blueness.
6/ Statistically significant differences at the 95 percent confidence level due to treatment effects.

Yarns from the 1955 crop, representing both oil treatments and one treatment with water plus a wetting agent applied at the rate of 8 gallons per bale, were woven into fabrics. Samples of these fabrics were dyed and their color was measured. No significant differences in either fabric color or appearance were found. Samples of the unbleached and undyed fabrics were examined by using an ultraviolet light with maximum radiation in the 3,660-angstrom range, and no differences that could be attributed to the picker treatments were found. Samples of lint from all the 1955 treatments were similarly examined with similar results. No fabrics were woven in 1956.

The results of the measurements made on the fiber, and on the spinning and finishing properties of the lint indicated no quality change in 1955 due to the picker treatments. However, the 1956 tests show a slight trend toward a different dyeing quality for treatments in which high rates of textile oil were used. Seed cotton drying was used at the gin on all treatments and possibly removed an appreciable amount of the textile oil applied to the lint by the picker spindles.

Stoneville, Miss.

Results of the Stoneville portion of the study are given in tables 3 to 10. As shown in table 3, the difference between water and water plus a wetting agent in mechanical picker efficiency was not significant at any time nor at any rate.

1955

The only significant difference between oil and the other treatments was in 1955. There was a trend, however, for the oil to reduce picking efficiency all 3 years. All materials kept the spindles clean at the rates used, but observations indicated that the oil kept the spindles and picker head cleaner than did the water treatments.

Similar to the California results, there was an increase in moisture between the stalk seed cotton and the wagon seed cotton picked with oil in 1955. In Stoneville, the logical explanation seems to be that the slight additional trash in the oil-picked seed cotton in 1955 caused the additional moisture; however, none of the differences in trash content of wagon seed cotton were significant.

The various spindle-moistening mediums or their rates of application appeared to have no adverse effects on the cleaning effectiveness of the gin machinery or any of the fiber quality elements measured. The gin drying systems eliminated the effects of any excess moisture added to the cotton at

Table 3. Efficiency of mechanical cotton picker as affected by application rate of various spindle moisteners, Stoneville, Miss., 1955-58.

Spindle moistener	Application rate per bale			Picker efficiency		
	1955[1/]	1956	1958	1955	1956	1958
	Gallons	Gallons	Gallons	Percent	Percent	Percent
Water	3.6	2.2	2.2	94.5	93.3	88.3
	6.2	6.1	6.1	94.7	92.7	87.5
Water plus wetting agent[2/]	3.6	2.2	2.2	95.2	93.1	89.3
	6.2	6.1	6.1	94.0	93.9	90.2
Textile oil[3/]	.28	.23	.23	91.8	92.6	82.6
	.49	.68	.68	92.2	93.2	84.5
L.S.D. at 5-percent level				2.79	N.S.	3.94
L.S.D. at 1-percent level				N.S.	N.S.	5.60

1/ In 1955 a third rate was also used but is not reported as it did not show different results from the rates shown here (which correspond to the rates used in 1956 and 1958.)

2/ The wetting agent was a nonionic surface agent with the chemical structure of an alkyl aryl polyether alcohol used at the rate of 1:240 with water.

3/ A chemically compounded mineral oil with a viscosity index of 42 at 100° F. and a specific gravity of 31-34. (Trade name, Texspray.)

the higher rates of application. The tests showed definitely that when oil is used to moisten the picker spindles, it will remain in the lint in measurable quantities through ginning. None of the moistening materials appeared to have any adverse effect on the measurable fiber or spinning properties. Furthermore, bleaching and dyeing tests failed to show any differences due to treatment (tables 4 and 5).

Table 4. Effect of various picker spindle-moistening materials, at low and high rates of application, on moisture and foreign matter content, classification, cotton fiber properties, and yield per acre, crop of 1955[1/].

Test item	Moistening material and rate of application					
	Water		Water and wetting agent		Oil	
	Low	High	Low	High	Low	High
Moisture content:						
Wagon sample, percent	6.6	7.4	6.8	6.9	8.8	9.4
Feeder sample, percent	4.9	5.2	5.0	6.0	6.5	6.6
Lint sample, percent	3.4	3.4	3.2	3.6	4.3	3.7
Foreign-matter content:						
Wagon sample, percent	6.1	6.7	5.0	5.2	5.7	6.9
Feeder sample, percent	1.2	1.0	0.8	1.2	1.3	1.2
Lint sample, percent	4.7	5.0	3.6	4.4	6.0	5.0
Classification:						
Grade, index [2/]	96.0	96.0	96.0	94.0	96.0	94.0
Staple length, 32d inch	34.5	34.5	35.0	34.0	34.0	35.0
Fibrograph length:						
Upper half mean, inches	1.11	1.12	1.12	1.13	1.12	1.12
Mean, inches	.86	.86	.84	.85	.84	.84
Uniformity ratio	78	76	76	75	74	75
Other fiber data:						
Strength, index	100	98	96	100	102	98
Fineness, micrograms per inch	3.5	3.6	3.5	3.5	3.0	3.6
Maturity, index	74	72	73	72	65	72
Neps (raw cotton), number	26	25	25	28	28	30
Oil content, percent	--	--	--	--	0.14	0.32
Seed cotton yield, pounds per acre	2,200	1,956	2,794	2,088	1,576	2,007

1/ Average of 2 replications.
2/ 100 = Middling; 97 = Strict Low Middling Plus; 94 = Strict Low Middling.

Table 5. Effect of various picker spindle-moistening materials, at low and high rates of application, on the manufacturing performance of cotton, crop of 1955.[1/]

Test item	Moistening material and rate of application					
	Water		Water and wetting agent		Oil	
	Low	High	Low	High	Low	High
Spinning data:						
Manufacturing waste, percent	10.0	10.0	10.1	10.6	12.0	11.4
Neps, per 100 sq. in. web	76	95	62	109	189	114
Ends down	Low	Low	Low	Low	Low	Low
Yarn strength, pounds						
22's	106	107	108	107	107	104
50's	38	38	38	38	38	37
50's (mercerized)	38	39	38	38	38	38
Yarn appearance grade:						
22's, code index	70	75	75	80	75	70
50's, code index	60	60	70	70	65	60
Average break factor	2,124	2,144	2,143	2,122	2,121	2,069
Average appearance, code index	65	68	72	75	70	65
Luster:						
Gray 22's	29.8	30.0	29.6	30.2	29.6	31.4
50's	30.6	31.2	31.1	31.0	30.8	31.7
50's (mercerized)	40.2	40.0	40.5	38.8	38.4	38.8
Color:						
Gray 22's Rd	70.5	70.2	70.8	69.6	69.4	68.1
+b	10.0	10.0	9.8	10.0	9.8	10.0
Bleached						
22's Rd	84.6	---	---	84.3	84.1	83.2
+b	3.1	---	---	2.8	3.4	3.1
Dyed 22's Rd	27.6	27.4	28.1	27.6	28.0	27.0
+b	19.5	19.5	19.6	19.3	18.7	19.0

1/ Average of 2 replications.

1956

The spindle-moistening materials did not affect quality of the lint as measured by classer's designation of grade and staple. The oil-treatment lots appeared not to clean as well in the seed cotton cleaning machinery, but after lint cleaning they were as low in lint foreign-matter content as were lots from the water and water-plus-wetting-agent treatments. None of the fiber properties measured were affected by either the material used or its rate of application. Oil content of the lint ranged from 0.47 percent for the water-treatment lots to 0.77 percent for the oil-treatment lots, the highest oil content being associated with the high-rate oil treatment.

Yarn strength appeared to be adversely affected by the application of textile conditioning oil. Only strength measurement for the mercerized 50's showed a statistically significant difference between the treatments, but for both 22's and 50's yarns, mercerized and nonmercerized, oil treatment showed a lower yarn strength. Yarn appearance was also adversely affected by the application of textile conditioning oil to the spindles. The high rate of application gave an average yarn appearance index of 70, as compared to an index of 78 for the low rate of application. Neps in the card web indicated the oil treatment resulted in more neps than did the water and water-and-wetting-agent treatments. Luster and color measurement showed no differences due to treatment (tables 6 and 7).

1958

In 1958, the nonionic wetting agent added to water as a spindle-moistening aid had no advantage or disadvantage over water alone in picking efficiency, ginning efficiency, spinning efficiency, or subsequent yarn finishing operations. Likewise, no significant differences were found in grade or fiber quality (tables 3 and 8).

The use of textile oil as a spindle-moistening agent showed certain disadvantages in both the picking operation through lowered picking efficiency, and in the spinning operation as is evident in lower yarn strength and in certain finishing processes.

Yarn strength for gray yarns, both 22's and 50's, was consistently lower for the oil-treatment lots. This reduction in yarn strength was approximately 4 percent. Lower yarn strength for the oil treatment was evident after mercerizing, again the reduction in strength being approximately 4 percent (fig. 1).

Table 6. Effect of various picker-spindle-moistening materials at low and high rates of application on the manufacturing performance and fiber properties of cotton, crop of 1956[1/]

Test item	Moistening material and rate of application					
	Water		Water and wetting agent		Oil	
	Low	High	Low	High	Low	High
Spinning data:						
Manufacturing waste, pct	10.06	9.87	10.24	10.21	10.42	10.72
Neps, per 100 sq. in. of web	41	40	44	52	50	64
Average yarn appearance, index	80	80	82	82	78	70
Yarn strength (unmercerized), pounds						
22's	122.9	123.0	123.4	121.2	117.5	116.4
50's	43.1	43.3	42.8	42.6	41.4	41.0
Yarn strength (mercerized), pounds						
22's	122.2	122.2	123.2	119.8	117.5	114.8
50's	43.2	42.2	42.0	42.2	41.1	40.8
Average break factor:						
Unmercerized	2,430	2,436	2,428	2,400	2,315	2,306
Mercerized	2,425	2,401	2,407	2,371	2,315	2,282
Fibrograph length:						
Upper half mean, inches	1.05	1.04	1.04	1.05	1.05	1.06
Mean, inches	.79	.77	.78	.79	.79	.81
Uniformity ratio	75	75	75	76	75	76
Other fiber data:						
Strength, index	105.7	103.7	105.3	102.3	102.3	102.3
Fineness, micrograms per inch	3.37	3.50	3.40	3.47	3.37	3.50
Maturity, index	74	73	75	75	74	75
Neps (raw cotton), number	34	39	39	40	39	33
Oil content, percent					.22	.32

1/ Average of 2 replications.

L.S.D. for moistening materials at 5-percent level, not significant (NS) except as follows: Yarn strength of mercerized, 50's, 0.9; average yarn appearance, 4.4. Neps in card, NS at 5-percent level, but significant at 10-percent level.

Table 7. Luster and color measurement data on gray, nonmercerized and mercerized, bleached and dyed yarn spun from cotton picked with three spindle-moistening materials applied at low and high rates, crop of 1956 1/

Test item	Moistening material and rate of application					
	Water		Water and wetting agent		Oil	
	Low	High	Low	High	Low	High
Luster:						
Gray 22's	32.0	34.1	31.6	31.9	31.6	33.4
50's	32.5	32.0	32.0	32.8	32.8	33.6
22's (mercerized)	39.2	39.4	38.2	39.0	38.2	39.0
50's (mercerized)	42.0	41.1	40.8	40.6	41.3	41.4
Color:						
Gray 22's Rd	70.4	71.6	70.7	71.2	70.1	69.0
22's +b	10.6	10.8	10.8	11.0	10.9	11.0
50's Rd	71.9	72.3	72.0	71.8	71.0	70.6
50's +b	10.4	10.4	10.7	10.8	10.6	10.8
Bleached:						
22's Rd	83.1	83.9	82.9	84.2	83.2	82.2
22's +b	3.5	3.6	3.6	3.8	3.8	3.9
50's Rd	83.8	84.8	83.8	84.9	82.8	83.8
50's +b	3.4	3.6	3.5	3.6	3.7	3.8
Dyed 22's Rd	25.3	25.7	25.0	25.4	25.2	25.3
22's +b	20.0	19.8	20.2	20.2	20.0	19.6
50's Rd	25.6	25.6	25.9	25.9	25.5	25.3
50's +b	20.7	20.6	20.6	20.4	20.5	20.6
Bleached and dyed:						
22's Rd	27.0	27.1	27.4	27.5	27.3	27.9
22's +b	25.8	25.6	25.4	25.4	25.5	25.3
50's Rd	26.8	27.1	27.6	27.8	27.8	28.2
50's +b	26.4	26.6	26.1	26.1	26.1	25.9

1/ Average of 2 replications.

L.S.D. for moistening materials at 5-percent level, not significant.

Table 8. Effect of various picker spindle-moistening materials, at low and high rates of application, on grade classification, manufacturing performance, and fiber properties of cotton, crop of 1958.

Test item	Moistening materials and rate of application					
	Water		Water and wetting agent		Oil	
	Low	High	Low	High	Low	High
Classification:						
Grade, index 1/	92.7	92.7	94.7	90.7	92.7	94.7
Staple, length, 32d inches	35.3	35.7	35.3	35.7	35.0	35.7
Spinning data:						
Manufacturing waste, percent	7.82	8.31	8.35	8.46	8.87	8.95
Neps, per 100 sq. in. of web	25	27	22	25	27	28
Yarn appearance (gray), index 22's	87	87	93	90	87	87
50's	80	80	83	80	77	80
Yarn strength (gray), pounds, 22's	116.5	119.3	117.9	117.7	113.6	112.5
50's	40.6	41.7	41.1	40.6	39.8	39.8
22's (mercerized)	116.5	119.1	116.5	116.9	113.5	113.1
Average break factor (gray yarns)	2,296	2,521	2,325	2,311	2,246	2,232
Fibrograph length:						
Upper half mean, inches	1.14	1.14	1.14	1.15	1.15	1.15
Mean, inches	.89	.90	.90	.91	.91	.91
Uniformity ratio	78	79	79	79	79	79
Other fiber data:						
Strength, index	99	102	99	98	101	98
Fineness (Causticaire), index	4.0	4.1	4.0	4.1	4.1	4.0
Maturity (Causticaire), index	78	78	78	78	78	78
Neps (raw cotton), per 1,000 sq. in. of web	34	29	30	32	31	33

1/ 100 = Middling; 94 = Strict Low Middling; 90 = Low Middling Plus.

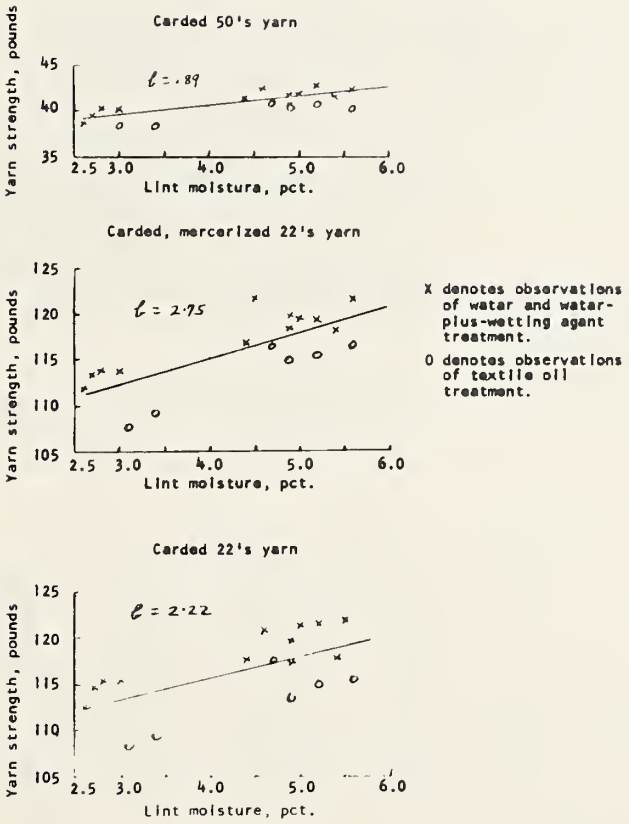

Figure 1. The relationship of lint moisture and yarn strength, Spindle Moistening Agents Tests, Stoneville, Miss., season 1958.

Color of raw cotton, as measured by the Nickerson-Hunter colorimeter, was adversely affected by the textile oil. This effect carried through into gray and mercerized yarn, but was not evident after the bleaching process. Color measurements of bleached, and bleached and dyed yarns showed no difference between spindle-moistening agents treatments (table 9).

SUMMARY

Materials evaluated for moistening cotton-picker spindles included water, water plus a wetting agent, and a textile oil. The results from California and Mississippi were in general agreement on the effects these agents have on picker performance. Textile oil used in lieu of water reduced picking efficiency, especially at low rates of application.

All three materials kept the spindles clean in these tests, but the oil appeared to keep the spindles and entire picker head cleanest. A wetting agent added to water kept the spindles cleaner than plain water.

There was no conclusive correlation between kinds or rates of moistening materials and the moisture content or trash content of the machine-picked seed cotton.

In the California tests, the results of the measurements made on the fiber, spinning, and finishing properties of the lint from the picker treatments indicated no quality change in 1955. However, in 1956, a slight trend toward a different dyeing quality was indicated for treatments in which high rates of textile oil were used. Seed cotton drying was used at the gin on all treatments and possibly removed an appreciable amount of the textile oil applied to the lint by the picker spindles. The analyses of classer's grades and picker performance indicate that textile oil, plain water, or water plus a wetting agent can be used without seriously affecting the grade of the cotton, but that oil reduces the efficiency of the mechanical picker, especially at low rates of application.

In the Stoneville, Miss., tests, adding a nonionic wetting agent to water as a spindle-moistening aid offered no advantage or disadvantage over water alone.

The use of textile conditioning oil as a moistening agent showed certain disadvantages in the picking operation through lowered picking efficiency, and in the spinning operation, as evidenced by lower yarn strength and in certain finishing processes.

Color of raw cotton as measured by a colorimeter was adversely affected by the textile oil, and this effect carried through into gray and mercerized yarn. Color measurements of bleached and dyed yarns, however, showed no difference between spindle-moistening agents. In most instances, differences due to effect of treatment were relatively small, the most pronounced being the reduction in yarn strength as associated with the textile oil treatment.

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